REMOVAL ACTION WORK PLAN
JORGENSEN FORGE EARLY ACTION AREA

Prepared for

U.S. Environmental Protection Agency
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On behalf of

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LIST OF ACRONYMS AND ABBREVIATIONS

Action Memo	Action Memorandum for a Non-Time-Critical Removal Action at the Jorgensen Forge Early Action Area of the Lower Duwamish Waterway Superfund Site in Seattle, Washington
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BA	Biological Assessment
BMP	best management practice
BODR	Basis of Design Report
Boeing	The Boeing Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHASP	Construction Health and Safety Plan
CMP	corrugated metal pipes
COC	chemical of concern
CQA	Construction Quality Assurance
CQAO	Construction Quality Assurance Officer
CQAP	Construction Quality Assurance Plan
CQC	Construction Quality Control
CRL	Columbia Ridge Landfill
CWA	Clean Water Act
Cy	cubic yard
DMU	dredge management unit
DoC	depth of contamination
DSOA	Duwamish Sediment Other Area
EAA	Early Action Area
Ecology	Washington State Department of Ecology
EE/CA	Engineering Evaluation/Cost Analysis
EMJ	Earle M. Jorgensen Company

EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
Facility	Jorgensen Forge facility
FSP	Field Sampling Plan
GAC	granular activated carbon
Gpd	gallons per day
HDPE	high-density polyethylene
H:V	horizontal to vertical
Jorgensen Forge	Jorgensen Forge Corporation
LDW	Lower Duwamish Waterway
mg/kg	milligrams per kilogram
mg/kg-OC	milligrams per kilogram of normalized organic carbon
MLLW	mean lower low water
MOU	Memorandum of Understanding
MTCA	Model Toxics Control Act
NTCRA	non-time-critical removal action
NTU	Nephelometric Turbidity Unit
Owner	Earle M. Jorgensen Company and Jorgensen Forge Corporation, collectively
PCB	polychlorinated biphenyl
Plant	Lafarge Cement Plant
QAPP	Quality Assurance Project Plan
RAB	removal action boundary
RACR	Removal Action Completion Report
RAO	removal action objective
RAWP	Removal Action Work Plan
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision

RTK GPS	Real Time Kinematic Global Positioning System
RvAL	removal action level
SMS	Sediment Management Standards
SOQ	Statement of Qualifications
SOW	Statement of Work
SQS	Sediment Quality Standards
TBD	To Be Determined
TSCA	Toxic Substances Control Act
TTD	Transload Transport and Disposal
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife Services
WM	Waste Management National Services
WQMP	Water Quality Monitoring Plan
WQMR	Water Quality Monitoring Report

1 INTRODUCTION

This Removal Action Work Plan (RAWP) has been prepared on behalf of Earle M. Jorgensen Company (EMJ) and Jorgensen Forge Corporation (Jorgensen Forge; herein referred to collectively as the Owner) pursuant to the Administrative Settlement Agreement and Order on Consent for Removal Action Implementation (AOC; U.S. Environmental Protection Agency [EPA] Region 10 Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 10-2013-0032) and attached Statement of Work (SOW).

The SOW requires submission of a RAWP, following EPA approval of the Final Basis of Design Report (BODR; Anchor QEA 2013a) and subsequent bid and selection of General Contractors to complete the work. In accordance with the SOW, this RAWP describes the construction activities planned as part of the implementation, coordination, quality assurance, and quality control activities for the removal of contaminated sediments and associated bank soils in a portion of the Lower Duwamish Waterway (LDW) Superfund Site adjacent to the Jorgensen Forge facility (Facility) located in Tukwila, King County, Washington (Figure 1; Jorgensen Forge Early Action Area [EAA]).

1.1 Work Plan Scope and Organization

This RAWP details the activities planned for in-water dredging, shoreline excavation, placement of backfill and shoreline containment, transport and off-site disposal of impacted sediments and soils, and associated construction and monitoring activities. The cleanup will be conducted as a non-time-critical removal action (NTCRA) in accordance with EPA's selected removal action alternative documented in the *Action Memorandum for a Non-Time-Critical Removal Action at the Jorgensen Forge Early Action Area of the Lower Duwamish Waterway Superfund Site in Seattle, Washington* (Action Memo; EPA 2011) and detailed in the *Final Engineering Evaluation/Cost Analysis (EE/CA) – Jorgensen Forge Facility, 8531 East Marginal Way South, Seattle, Washington* (Anchor QEA 2011).

The RAWP is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Removal Action Description
- Section 3 – Project Team Formulation

- Section 4 – Contractor Work Plan
- Section 5 – Construction Quality Assurance/Quality Control
- Section 6 – Project Schedule
- Section 7 – References

1.2 Background

EMJ entered into an AOC with EPA on July 10, 2003 (EPA Docket No. CERCLA-10-2003-0111), to investigate whether the Facility, which is currently owned and operated by Jorgensen Forge and formerly owned and operated by EMJ, is or has been a source of polychlorinated biphenyls (PCBs) to the LDW. The analytical results of soil and sediment samples collected during the investigation detected concentrations of PCBs in sediment and soil on the shoreline bank in the LDW adjacent to the Facility. EPA determined that these concentrations present a risk to human health and the environment and met the criteria for conducting a NTCRA under CERCLA (EPA 2008a). EPA and EMJ entered into the First Amendment to the AOC in April 2008. This amendment required EMJ to prepare an EE/CA, Biological Assessment (BA), and Clean Water Act (CWA) Section 404(b)(1) Evaluation for the completion of a NTCRA of sediments and associated shoreline bank soil in the Jorgensen Forge EAA removal action boundary (RAB) that contain concentrations of chemicals that exceed the Washington State Department of Ecology (Ecology) Sediment Management Standards (SMS) Sediment Quality Standards (SQS). The RAB was approved by EPA in 2008 (EPA 2008b).

The Owner previously submitted a Draft EE/CA, Second Draft EE/CA, and Final EE/CA to EPA in March 2009 (Anchor QEA 2009), November 2010 (Anchor QEA 2010), and October 2011 (Anchor QEA 2011), respectively. EPA provided conditional approval of the Final EE/CA with slight modifications in a letter dated September 29, 2011, and subsequently provided formal approval of the Final EE/CA and selected the removal action alternative (Alternative 4 in the Final EE/CA) in the Action Memo (EPA 2011). The issuance of the Action Memo completed the requirements of the AOC (EPA Docket No. CERCLA-10-2003-0111). Design, construction, and long-term operations, maintenance, and monitoring are being conducted under a new AOC (EPA Docket No. 10-2013-0032) entered into between EPA and EMJ.

1.3 Site Access and Security

The Facility is a secure site with entry and exit only allowed through the main gate located on East Marginal Way South. The General Contractors will follow all of Jorgensen Forge's security protocols upon entry to the Facility. In the event that the General Contractors need access into or out of fenced or gated locations elsewhere on the Facility, the General Contractors must notify the Jorgensen Forge representative at least 24 hours in advance to arrange for additional security oversight. The General Contractor's employees, and all subcontractors and material vendor employees, shall check in at the main gate and obtain a visitor badge on a daily basis. The General Contractors will submit a complete list of personnel expected to be on site within the duration of the work. Entry of Contractors employees, subcontractors, or vendors not listed shall be coordinated in advance through the Jorgensen Forge representative. All personnel entering the Facility shall carry current photo identification. Deliveries of materials and equipment shall be coordinated in advance through the Jorgensen Forge representative and arrive at the main gate.

Jorgensen Forge's security procedures require that all visitors to the Facility comply with a Visitor Security Plan, in accordance with the security requirements imposed by Jorgensen Forge's contracts with the U.S. Navy, U.S. Navy suppliers, and other defense-related firms. The Visitor Security Plan establishes specific requirements for visitor security and access to the Facility. Jorgensen Forge also requires that all visitors have the appropriate safety training for the work they will perform and are citizens of the United States. All non-U.S. citizens must be escorted at all times. A chain-link fence secures the entire western boundary of the Facility adjacent to the RAB. The removal action will require reconfiguration of the shoreline bank east of this fence, so the fence will need to be relocated further east. In accordance with the Visitor Security Plan, Jorgensen Forge requires that a fence be maintained and secured during completion of the removal action activities to restrict access to individuals with the appropriate security clearance and safety training. Any ingress or egress through this fence or the main access gate will require clearance by a security guard and possession of a visitor badge. Jorgensen Forge will provide the necessary safety training for all visitors that will enter the facility through this fence or the main gate.

Visitors must don the appropriate safety gear (as communicated during the safety training) during their access on the Facility.

1.4 Coordination with Adjacent Regulatory Cleanup Activities

Boeing is conducting an interim corrective action under the Resource Conservation and Recovery Act (RCRA) adjacent to the Boeing Plant 2 Facility in the area immediately adjacent and downstream from the RAB (Figure 2). This corrective action area is termed the Duwamish Sediment Other Area (DSOA) and Southwest Bank Corrective Measure and is also identified as an EAA by EPA. EPA collectively defined the DSOA and the Jorgensen Forge EAA as EAA-4. Due to the adjacency and shared cleanup boundaries of these EAAs, the First Amendment to the Investigation AOC (EPA 2008a) between EMJ and EPA incorporated a Memorandum of Understanding (MOU) executed by the Owner and Boeing. The MOU requires the coordination and cooperation of all parties conducting cleanup within the adjoining Boeing DSOA and RAB. In accordance with the MOU, the adjacent cleanup designs are coordinated and will be constructed so that the goals for both cleanups are achieved. EPA has approved (EPA 2013) that the Jorgensen Forge EAA cleanup will proceed first and extend up to the in-water and toe of shoreline slope cleanup boundaries with the Boeing DSOA. The Boeing DSOA cleanup will then be initiated in early January 2014 and will generally proceed from the upstream cleanup boundaries with the RAB to downstream. Boeing is responsible for ensuring that their cleanup activities do not lead to recontamination within the Jorgensen Forge RAB and that any adverse impacts (e.g., slope stability, removal/relocation of containment materials, etc.) to the newly constructed shoreline bank in the RAB are mitigated to achieve the Jorgensen Forge EAA design criteria.

Jorgensen Forge and Boeing are performing a non-time-critical removal action under a Second Modification to the AOC (EPA CERCLA Docket No. 10-2011-0017) with the EPA Office of Emergency Response. This removal action will include the installation of a sheeptile wall and the collection of Geoprobe soil borings in the northwest corner of the Facility (Figure 3). This work is scheduled to be conducted concurrently with the removal action activities within the RAB. As discussed in Section 10.4 of the BODR and the Construction Drawing and Construction Specifications (Appendices G and H of the BODR, respectively; Anchor QEA 2013a), elevated soil PCB concentrations have been identified at

up to 32 feet below ground surface along the top of shoreline bank area adjacent to the discharge locations of the Boeing 12-inch property line outfall and directly adjacent 24-inch property line outfall. It is not known whether the elevated PCB concentrations extend below the shoreline bank within the directly adjacent RAB. Geoprobe soil borings will be advanced to determine the below shoreline bank PCB concentrations and whether additional dredging may be required under the target shoreline bank removal elevations. A sheetpile wall will be installed to eliminate migration of the identified elevated soil PCB concentrations into the directly adjacent LDW. Given the overlapping footprints of the two cleanup actions, the designs for these removal action activities will be sequenced and coordinated to achieve both projects' cleanup goals.

This RAWP does not account for coordination with the cleanup that will be conducted in the EPA-identified EAA-5 at Terminal 117, directly across the LDW from the Jorgensen Forge property (Figure 1), as it will be initiated following the scheduled completion of the removal action within the RAB.

2 REMOVAL ACTION DESCRIPTION

The following subsections provide an overview of the removal action, including a description of the EPA-approved alternative, the EPA-directed removal action objectives (RAOs), and the performance standards established in the Basis of Design Report (BODR; Anchor QEA 2013a).

2.1 Removal Action Description

The EPA-approved removal action alternative (EPA 2011) includes the vertical and horizontal removal of total PCB removal action level (RvAL) sediment and shoreline bank exceedances identified within the RAB. EPA set the RvAL to be equivalent to the Ecology SMS SQS for total PCBs. In accordance with EPA's direction, the RAB was developed by screening the available sediment and shoreline bank soils total PCB data against the total PCB RvAL. Based on the findings of the data screening and the site-specific conditions described in the Final EE/CA (Anchor QEA 2011), the EPA-approved RAB was identified as the 1.6-acre area shown in Figure 2, and is bounded by the following:

- To the east, by the top of the shoreline bank (including the top of the sheetpile and concrete panel walls) extending from the northern to southern Facility property boundaries, with two areas extending just beyond the top of shoreline bank, as discussed below
- To the south, by the extension of the southern Facility property boundary from the top of the concrete panel wall to the eastern boundary of the federal navigation channel
- To the west, by the eastern boundary of the federal navigation channel extending from the southern boundary to the Boeing DSOA in-water cleanup boundary identified in the MOU (EMJ et al. 2007) followed by the surveyed (during low tide on August 28, 2008) toe of riprap elevation north of the in-water cleanup boundary
  - Per EPA's letter (2008b), the western boundary includes an isolated 20-foot extension into the federal navigation channel centered on core sampling station SD-322-S
- To the north, by two boundaries: 1) the Boeing DSOA in-water cleanup boundary on the southern end; and 2) the Facility northern property line on the northern end

The removal action includes shoreline bank excavation and placement of slope containment materials. This portion of the shoreline is degraded, containing elevated chemical concentrations above the SMS SQS criteria and RvAL exceedances; highly armored and over-steepened (approximately 1 to 1 horizontal to vertical slope [1H:1V slope]) banks; and derelict creosote-treated piles, remnant overhanging asphalt pads, and other types of debris. Existing derelict creosote-treated piles, overhanging asphalt structures, and debris will be removed from the bank prior to excavation and slope containment. Upon excavation to the target depths, inert debris identified along the new surface may be allowed to remain in place if doing so would not affect the function of the overlying slope containment. The removed materials will be transported and disposed at an off-site RCRA-permitted Subtitle D disposal facility.

Following completion of the shoreline bank excavation to the design grades, clean slope containment materials will be placed on the post-excavation surface. The slope containment will be composed of a 1.5-foot "filter" layer amended with granular activated carbon (GAC; consisting of sandy gravel to gravelly sand), overlain by a 2.5-foot "armor" layer (consisting of light loose riprap), and further overlain by a 0.5-foot layer of habitat substrate (anticipated to consist of rounded or sub-rounded 2.5-inch minus gravel). The filter layer will act as a containment layer; the armor layer will function to protect the filter layer from erosion; and the habitat layer will provide a uniform habitat substrate within the intertidal areas that functions to fill the interstitial areas of the armor layer.

The removal action will be completed such that impacts to the existing sheetpile wall and concrete panel walls (located along southwest portion of shoreline), as well as impacts to existing in-use concrete foundations and structures within close proximity to the top of shoreline bank, are minimized. This minimization will include offsets during dredging to minimize undermining as well as damage from construction equipment.

Concurrent with completion of the shoreline bank excavation, Ecology recommended that Jorgensen Forge consider removal of additional soil from the top of the shoreline bank proximate to borings SB-3 and SB-4 containing surface total PCB concentrations above the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A soil cleanup levels for industrial properties (10 milligrams per kilogram [mg/kg] total PCBs), as

established in Section 745 of Chapter 173-340 of the Washington Administrative Code (WAC; Figure 4). Jorgensen Forge has agreed to conduct the additional removal as shown in Figure 4 and described in the Interim Action Work Plan (Anchor QEA 2013b). The area of additional removal is beyond the proposed reconfigured top of bank described in the EPA-approved Final EE/CA and Action Memorandum (EPA 2011), so this removal will not be administered under the EPA AOC. Rather, this additional soil removal will be completed by Jorgensen Forge as an Interim Action under Amended Ecology Agreed Order (No. DE 4127). Jorgensen Forge will perform the Interim Action soil removal prior to initiation of the EPA removal action shoreline bank reconfiguration activities (see Section 4.3).

2.2 Removal Action Objectives

As described in Section 4.1 of the EE/CA, the removal action is being prepared prior to the Record of Decision (ROD) for the LDW Superfund Site; therefore, final RAOs and final removal action standards, including the vertical point of compliance, target media removal action levels, and sediment removal action boundaries, have not been determined. For the purpose of this RAWP, prepared prior to completion of the ROD, the following EPA-directed (EPA 2010) RAOs were used to maintain consistency with the current removal action objectives required throughout the LDW Superfund Site:

1. Human Health – Seafood Consumption. Reduce human health risks associated with the consumption of resident LDW seafood by reducing sediment and surface water concentrations of chemicals of concern (COCs) to protective levels.
2. Human Health – Direct Contact. Reduce human health risks associated with exposure to COCs through direct contact with sediments and incidental sediment ingestion by reducing sediment concentrations of COCs to protective levels.
3. Ecological Health – Benthic. Reduce toxicity to benthic invertebrates by reducing sediment concentrations of COCs to comply with Ecology SMS SQS.
4. Ecological Health – Seafood Consumption. Reduce risks to crabs, fish, birds, and mammals from exposure to COCs by reducing concentrations of COCs in sediment and surface water to protective levels.
5. Groundwater and Sediment Protection. Reduce migration of contaminants in groundwater to sediments to reduce risk to human health and the environment.

To achieve these RAOs in the 0-to 1.5-foot vertical point of compliance, EPA directed the use of the SQS for total PCBs (12 milligrams per kilogram of normalized organic carbon [mg/kg-OC]) as the appropriate delineating criterion and the appropriate RvAL for sediment removal and/or shoreline containment in the RAB (EPA 2010). The use of the total PCB SQS criterion as the RvAL for sediment removal and shoreline containment is consistent with the LDW Slip 4 EAA, Terminal 117 EAA, and Boeing Plant 2 DSOA EAA cleanups.

As identified in EPA's Action Memo (EPA 2011), the EPA-selected removal action will meet the above RAOs with the exception of the RAO for human seafood consumption over the long term. The Action Memo states:

> *The RBCs* [Risk Based Concentrations] *necessary to protect unlimited human seafood consumption are very stringent. The goal for the LDW as a whole is to get as close to them as practicable. Achieving them may be impossible as they are more stringent than background concentrations, including natural background as defined by MTCA. However, this sediment removal will remove all contaminant concentrations over its aerial extent and will replace them with clean fill material meeting the backfill levels for final actions. Upon completion therefore, these formerly contaminated sediments will meet all cleanup goals and levels until they are recontaminated, to however marginal degree, by surrounding LDW concentrations, and LDW sources generally. These later post-NTCRA levels will be addressed by the LDW Record of Decision in a manner consistent with the rest of the LDW since the Jorgensen Forge EAA will remain part of the LDW site after this NTCRA is completed. It is important to emphasize that protective levels of COCs, particularly PCBs, are well below background concentrations, so it will not be possible, based on everything we know at this time, over the long term, to completely eliminate any unacceptable risk from this pathway without limiting fish consumption to some degree.*

2.3 Performance Standards

To achieve the Jorgensen Forge EAA RAOs, performance standards were established in the BODR (Anchor QEA 2013a). These performance standards were used to guide the removal action design, construction, construction verification, and long-term monitoring activities.

2.3.1 In-water Dredging and Off-site Disposal

The following in-water dredging and off-site disposal performance standards were established:

- Impacted sediment, defined as sediments containing total PCB concentrations greater than the total PCB RvAL, shall be removed within the EPA-approved RAB.
- The work shall be completed consistent with best management practices (BMPs) in order to minimize dredge residuals, releases, and recontamination of adjacent areas outside the RAB.
- The work shall be completed consistent with BMPs and EPA-prepared 401(c) Water Quality Memorandum requirements in order to minimize water quality impacts outside the compliance boundary.
- The dredged sediment shall be transported to a future identified off-site offloading facility anticipated to be located within the LDW and subsequently hauled and disposed at an approved landfill facility.

2.3.2 Backfill of Dredge Areas

The following backfill performance standards in dredge areas were established:

- Areas dredged to remove sediments and soils exceeding the total PCB RvAL shall be restored to roughly the pre-removal grade with backfill material. Some areas within and directly adjacent to the navigation channel and on the shoreline bank may be at lower elevations following backfilling than pre-removal grade.
- The gradation of the backfill material shall be such that the surface of the backfill material generally remains stable without significant erosion over time.
- Imported backfill material shall meet defined chemical and geotechnical goals.
- The work shall be completed consistent with BMPs in order to minimize adjacent slope instability and dredge residuals migration.

- The work shall be completed consistent with BMPs and the EPA-prepared 401(c) Water Quality Memorandum requirements in order to minimize water quality impacts outside the applicable compliance boundaries.

2.3.3 Shoreline Stabilization

The following shoreline stabilization performance standards were established:

- The shoreline bank shall be regraded to a flatter slope to promote better long-term stability.
- The nearshore bank sediment, soil, piles, concrete, and debris excavated from the designated shoreline shall be disposed of at an approved landfill facility.
- The excavated surface of the shoreline bank shall be contained and armored to resist erosion and instability. The surface armoring shall be designed to resist bed shear velocities induced by a 100-year flood flow, 100-year wind-induced waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area. The armoring design also accounts for projected sea level rise in the Puget Sound area.
- The target total thickness of the shoreline bank containment shall be a minimum of 4 feet thick and will include 1.5 feet of filter material overlain by 2.5 feet of armor overlain by 0.5 feet of habitat material.
- Imported shoreline bank stabilization materials shall meet defined chemical and geotechnical goals.
- The work shall be completed consistent with BMPs in order to minimize slope instability during construction, in-water work based on tidal elevations during construction, and excavation residuals migration.
- The work shall be completed consistent with BMPs and EPA-prepared 401(c) Water Quality Memorandum requirements in order to minimize water quality impacts outside the compliance boundary.

3 PROJECT TEAM FORMULATION

The following subsections present the tentative formulation of the Project Team, including roles and responsibilities of the parties involved in the removal action activities. A Project Team Organization Chart is presented in Figure 5. The Project Team consists of agency personnel, construction management and oversight personnel (the owner, project engineer, and construction quality assurance officer), and construction Contractor personnel (on-site superintendent, quality control manager, health and safety manager, and subcontractors).

3.1 Agency Personnel

EPA is the regulatory authority and is the responsible agency for overseeing and authorizing all removal action activities described herein, except the Ecology-managed Interim Action soil excavation from the top of shoreline bank proximate to borings SB-3 and SB-4 (see Section 2.1). In this capacity, EPA will review information described in the BODR and this RAWP for consistency with the RAOs, the AOC, and Applicable or Relevant and Appropriate Requirements (ARARs). The EPA Project Coordinator, or a designee, will exercise project oversight for EPA, coordinate comments developed by EPA and other agencies, and communicate agency observations with the Owner and the Project Engineer. The EPA Project Coordinator shall notify the Owner if they identify any concerns regarding the implementation of the removal action. The Owner, or a designated representative, will propose to EPA and the EPA Project Coordinator response measures or recommendations, as appropriate. EPA, as appropriate, will make final decisions to resolve such issues or problems that may change the removal action scope.

EPA will work cooperatively with other federal and government agencies, including Ecology, as necessary. The other agencies will continue to review documents and participate in decision making related to the removal action, as necessary and facilitated by EPA. Other agencies will provide their comments to the EPA Project Coordinator for communication to the Owner.

3.2 Construction Management and Oversight Personnel

The following sections identify the construction management and oversight personnel.

3.2.1 Owner

The Owner is ultimately responsible for implementing the removal action in accordance with the AOC and SOW. The Owner, or a designated representative(s), will implement the RAWP, review Contractor work products, and be the point of contact(s) with EPA.

3.2.2 Project Engineer

The Project Engineer is responsible for two main tasks. First, the Project Engineer is responsible for preparing the design of the removal action to achieve the AOC and construction activity-specific objectives and requirements. Additionally, the Project Engineer will provide consultation and observations during construction to assist with implementation of the removal action in conformance with the EPA-approved design documents (Anchor QEA 2013a). During implementation of the removal action, potentially non-compliant construction activities will be referred to the Project Engineer. The Project Engineer is responsible for determining whether the allegedly non-compliant construction is acceptable within the design; unacceptable; or acceptable with a design modification. EPA will have final authority to approve design modifications proposed by the Project Engineer.

3.2.3 Construction Quality Assurance Officer

The Construction Quality Assurance Officer (CQAO) will be responsible for overseeing the implementation of the Construction Quality Assurance Plan (CQAP; Appendix D of the BODR; Anchor QEA 2013a). In overseeing implementation of the CQAP, the CQAO is responsible for monitoring construction performance for compliance with construction performance standards and design requirements during implementation of the removal action, and is responsible for overseeing the required inspection and verification activities. The CQAO will review documentation submitted by and work completed by the Contractors for adherence to performance standards and design requirements. The CQAO will be sufficiently familiar with the EPA-approved design documents and the construction operations to recognize deviations from those documents. The CQAO will also have the ability to manage and maintain the integrity of the data generated during implementation of the removal action.

The CQAO will be responsible for identifying those field conditions that may warrant deviation from the EPA-approved design documents. In such circumstances, the CQAO will coordinate with the EPA Project Coordinator to identify and agree upon any necessary deviations to meet the overall objectives of the design. Any agreed-upon deviations will be documented in the weekly progress reports to EPA.

The CQAO may use inspectors with the requisite expertise and experience to help perform the duties described above.

3.3 General Contractors

The General Contractors will be responsible for implementing the removal action by either performing tasks or contracting with subcontractors. The General Contractors are responsible for ensuring that the work complies with the requirements of the Construction Drawings and Construction Specifications (Appendix G and H of the BODR, respectively; Anchor QEA 2013a) and provides all necessary quality control information.

As part of the removal action implementation, the General Contractors will be responsible for developing and implementing the Contractor Quality Control Plan (see Section 4.10), including the required monitoring, sampling, testing, and reporting needed to implement the project in accordance with the Construction Drawings and Construction Specifications (Appendix G and H of the BODR, respectively; Anchor QEA 2013a). Independent of the General Contractor's quality control program, Jorgensen Forge will implement the CQAP (Appendix A of the BODR; Anchor 2013a) to verify that the removal action is implemented in accordance with the design. In accordance with implementing the removal action construction activities, the General Contractor's will oversee the development of an Environmental Protection Plan (EPP; see Section 4.11).

3.3.1 Contractor Selection

Envirocon and Waste Management, Inc. were selected through a competitive qualifications-based selection process. Envirocon and Waste Management, Inc. were the selected contractors for the first season Boeing DSOA cleanup completed in 2012. Envirocon and Waste Management, Inc. were provided the bid documents in May 2013 and selected by the

Owner in July 2013 based on review of their bid prices and site-specific experience and qualifications to perform the removal action. The Owners are currently finalizing the contract with Envirocon and Waste Management and will provide the notice to proceed immediately thereafter.

3.3.2 Contractor Personnel

The General Contractors will use key personnel to help with the tasks described above, including an On-site Superintendent, Construction Quality Control (CQC) Manager, and Health and Safety Manager. The roles and responsibilities of these key personnel are described in the following sections.

3.3.2.1 On-site Superintendent

Direction of the work for the Contractor will be through an On-site Superintendent who will be responsible for executing the work in full compliance with the Construction Drawings and Construction Specifications (Appendix G and H of the BODR, respectively; Anchor QEA 2013a). The Superintendent will work to resolve work-related problems and day-to-day project management. The Superintendent may utilize one or more foremen to directly supervise the major construction activities. The Superintendent will exercise supervision over subcontractors, if subcontractors are utilized.

3.3.2.2 Contractor Construction Quality Control Manager

A CQC Manager will be provided by Envirocon as required in the Construction Specifications (Appendix H of the BODR; Anchor QEA 2013a). The CQC Manager will develop and implement the Contractor Quality Control Plan through which the Contractor ensures compliance with the requirements of the Construction Specifications and Drawings. The Contractor Quality Control Plan will identify the duties and responsibilities assigned by the Contractor to the CQC Manager and additional inspectors, as needed to monitor that the removal action is implemented in accordance with the Construction Specifications and Drawings. The Contractor Quality Control Plan will state the chain of command for the CQC team, including identification of responsibilities for each member, to ensure that any actions related to the quality of work will be executed in an accurate and expeditious manner.

3.3.2.3 Contractor Health and Safety Manager

The General Contractors will employ a Health and Safety Manager to develop and implement a Construction Health and Safety Plan (CHASP). The CHASP will contain details of the chain of command and personnel responsibilities, as discussed in the Construction Specifications. The Health and Safety Managers will be required to have the appropriate current federal and state health and safety training necessary to perform the work.

3.3.2.4 Subcontractors

The General Contractors will either perform construction elements or contract with subcontractors to perform selected phases of the work for which they have special expertise. The subcontractors are responsible to the General Contractors for the quality of their work, protection of the environment, Contractors Quality Control Plan, EPP, and CHASP. The subcontractors' principals will each designate a job foreman with responsibility to see that the work is conducted in accordance with the contract requirements and the Construction Drawings and Construction Specifications (Appendix G and H of the BODR, respectively; Anchor QEA 2013a).

3.3.3 Contractor Qualifications

The General Contractors will employ (as part of its permanent organization) senior, knowledgeable, and experienced personnel to oversee the project. The journeyman operators, surveyors, and other General Contractor personnel performing key jobs must also have the demonstrated ability and skills to satisfactorily perform their respective assignments.

The Envirocon CQC Manager must have documented qualifications and experience to perform independent checks on the General Contractor's operations as necessary to determine compliance with the Construction Drawings and Construction Specifications (Appendix G and H of the BODR, respectively; Anchor QEA 2013a). These documented qualifications will be submitted to the Owner for approval prior to identifying a CQC Manager. Additionally, any subcontractors utilized in the work must have demonstrated to the satisfaction of the Owner that they are qualified and have satisfactorily performed the

type of work for which they will be engaged. However, responsibility for the subcontractor performance rests with the General Contractors. All General Contractor and subcontractor personnel working on this project will be required to have current federal and state health and safety training, as applicable to the work they will be doing on this project.

4 CONTRACTOR WORK PLAN

The following subsections present the Contractor's planned methods to implement the removal action. Work will be conducted in accordance with the Construction Drawings and Construction Specifications, Appendices G and H of the BODR (Anchor QEA 2013a), respectively.

4.1 Project Work Plan Overview

The General Contractor's work scopes will include the following tasks:

- Mobilization
- Installation of security fencing and set up of temporary facilities
- Protection of existing features, as required
- Creating new import, export, and debris sizing stockpile areas
- Pulling of timber pilings and shoreline and bank area demolition and debris removal
- Excavation of shoreline and bank areas
- Dredging sediments within the RAB
- Transportation and disposal of removed materials and debris
- Backfilling and shoreline containment
- Site restoration
- Installing permanent fencing
- Demobilization

4.1.1 Summary of Contractor Means and Methods

Work will begin with the installation of security fencing and setup of temporary facilities. A stockpile containment area will be constructed to allow for temporary stockpiling of excavated upland and shoreline bank materials. The stockpile area will contain impacted soil and capture any water that may drain from the soil. Preparation of the area will include placing ecology blocks and sealing the stockpile containment with a plastic liner. Import materials that are delivered to the Facility may also need to be stockpiled. Separate areas will be created for excavated material, clean import materials, and demolition debris sizing. Signs will be posted to clearly designate each area and aid in tracking of materials.

The abandonment of eight existing outfalls and demolition activities, including removal of debris within the intertidal bank area, will be completed following the installation of security fencing and setup of temporary facilities. It is expected that there will be varying degrees of buried debris and demolition encountered during bank excavation. Timber pile removal will be conducted prior to shoreline bank excavation using a 90-ton crane equipped with a vibratory hammer power pack. Laborers with chain saws will assist when removal is not possible using the vibratory hammer. Additional details on demolition activities are presented in the Demolition Plan (Section 4.2).

The shoreline bank will be excavated from land with the maximum extent of shoreline excavation occurring during low tides to maximize work "in the dry". The lower low tides occur at night during the schedule excavation activities in September; therefore, the shoreline bank excavation will be performed at night. Excavation activities will proceed from south (upriver) to north (downriver) along the shoreline.

Dredging will take place following upland and intertidal excavation or after upland excavation has proceeded north of the dredging area. Dredging will also proceed from south to north and will be performed to remove materials from higher elevations (upslope) to lower elevations (downslope). If required, based on the results from the additional soil Geoprobes collected under the Boeing and Jorgensen Forge AOC (see Section 1.2), the final stage of dredging may remove sediment with PCB concentrations that are managed under the Toxic Substances Control Act (TSCA) and will be disposed of separately from the other sediment to be removed. The dredged TSCA sediment will be direct loaded into containers staged on sediment material barges and off-loaded with a crane. The total volume of dredge sediment to be removed is expected to be between 18,000 and 19,000 cubic yards (cy). Additional details on dredging and excavation activities are presented in the dredging/excavation, haul barge transport, and dewatering plan (Section 4.3)

In-water backfilling will be performed following dredging but prior to shoreline and bank backfill to prevent potential sloughing and disturbance of remaining sediments. Backfilling activities will proceed from south to north. As discussed in Section 4.1.2, a 6-inch layer of backfill will be placed as soon as practicable following completion of dredging within the Contractor-defined dredge management units (DMUs). The area below the toe trench

(-5 mean lower low water [MLLW]), will be backfilled with sand. The area above the toe trench will consist of a minimum 1.5-foot filter layer (gravelly-sand or sandy-gravel amended with 0.5percent GAC), followed by a minimum 2.5-foot riprap armoring layer, and then a minimum 0.5-foot habitat substrate layer. The toe trench will be backfilled consistent with the Construction Drawings (Appendix G of the BODR; Anchor QEA 2013a). Additional details on backfilling and shoreline containment activities are presented in the backfilling plan (Section 4.5).

4.1.2 Project BMPs

Consistent with the BODR (Anchor QEA, 2013a), the following section details the BMPs that have been or will be implemented during the removal action to reduce suspension of sediment and soil into the water column while maintaining construction productivity.

Depth of Contamination

This BMP involves the following actions:

- Develop an accurate model for depth of contamination (DoC).
- Use the results of the completed sediment coring program, in combination with geospatial analysis, to develop an accurate DoC to be removed during dredging.

The purpose of accurately measuring DoC elevation is to accurately characterize the extent of the target material with a high degree of confidence for input into the dredge plan.

Design Dredge Elevation

This BMP involves the following action:

- Use the DoC findings, plus an allowance for dredge accuracy and tolerance, to develop an accurate design for dredge elevations.

The purpose of accurately measuring the design dredge elevation is to develop a dredging plan with a high degree of confidence that the target material will be removed efficiently in a single dredging event. The design dredge elevation was set at the DoC elevation with a non-paid overdredge allowance of 2 feet to account for the vertical tolerance of a precision excavator dredge.

Single Dredging Event

This BMP involves the following action:

- Perform dredging to the design dredge elevation in a single dredge event, as verified by periodic bathymetric surveys.

Performing a single dredging event relies on implementation of the design dredge elevation BMP, so that each subunit can be dredged to the required elevation, verified with bathymetric surveys, and then as soon as practical within the operational efficiency of the project place of a minimum 3- to 6-inch thick lift of clean backfill material over the dredge subunit. This BMP also allows the dredged area to be quickly covered, reducing the potential for ongoing resuspension and release from the loosened residual sediment.

Sand Cover

This BMP involves the following actions:

- Place a clean sand cover (3 to 6 inches) over dredge cuts in each subunit of the RAB in a timely manner, as soon as practical after dredging of the subunit is complete.
  - This placement will limit the potential for resuspension and release of sediment from the loosened post-dredging residual material.
- Phase additional backfilling, as appropriate, once all upstream and adjacent dredging is complete.
- The final layer of backfill within the RAB will be placed to the final target grade after all dredging is complete.

Dredging Equipment

This BMP involves the following action:

- Select the appropriate dredging equipment (excavator or derrick) based on the RAB conditions and accuracy requirements.

EPA directed the use of an excavator (also known as an articulated fixed-arm dredge) with a closed environmental bucket as the primary dredging equipment for the removal action (EPA 2011c). As described in Appendix E of the Final EE/CA (Anchor QEA 2011a) for areas

where an excavator with an enclosed bucket is unable to remove the encountered materials due to the physical characteristics (e.g., material is too stiff, large debris, pilings, etc.), a conventional derrick with clamshell, grapple, or vibratory hammer will be used.

Dredging Bucket

This BMP involves the following actions:

- Use an enclosed environmental type bucket to limit sediment loss to the extent possible.
- A standard clamshell bucket may be required for denser sediments and debris removal.

Larger debris that have been identified in the RAB, such as trees, large concrete blocks, intact and broken pilings, and molten debris piles, are likely beyond the lifting capacity of an enclosed environmental-type bucket. In areas where a closed environmental bucket is unable to remove the encountered material, a heavier bucket with digging capabilities, or a conventional wire-supported clamshell dredge or grapple will be required. Use of an enclosed bucket may limit the loss of sediment from the bucket to the water column, depending on the amount of debris encountered. Limiting loss from the bucket limits the resuspension and release from dredging. The use of other heavy-duty equipment during hard material and debris removal may include an open bucket.

Dredge Bucket Positioning

This BMP involves the following action:

- Use sub-foot accuracy GPS for accurate bucket positioning.

Using on-board Real Time Kinetic (RTK) GPS digital equipment capable of displaying the location of the dredge bucket within 4 to 6 inches horizontally and vertically will help to assure that the target material is captured by the dredge.

Dredge Cuts on Slopes

This BMP involves the following action:

- Implement stair-step dredge cuts for steeper slopes to reduce sloughing of sediment.

- Dredge from the top of the slope downward.

Implementing stair-step dredge cuts limits the bank sloughing that can occur with deep vertical cuts into the sediment (referred to as "box cuts"). Dredge cuts that extend several feet vertically into the sediment bed will eventually slough to a flatter and more stable slope. The sloughed sediment will be remolded with water and will come to rest on the bed as a lower density, higher water content, and lower strength-generated residual that is more easily eroded and suspended than native intact sediment. Stair-stepping the dredge cuts helps to reduce the formation of generated residuals and reduces the potential for resuspension and release. In addition, slopes will be excavated from the top down to avoid raveling and sloughing.

Piling Removal

This BMP includes removal of piling in a manner that minimizes the release of sediment. Piling removal will require conventional marine construction equipment, such as a derrick configured with pile-pulling and heavy lifting equipment. If a vibratory hammer is used, care shall be taken not to destabilize slopes and banks. If individual pilings cannot be removed, then they will be cut off at the sediment/soil excavation surface or at least 3 feet below the final grade, whichever is deeper.

Dredge Slopes with Excavator

This BMP involves the following action:

- Use an excavator dredge, as appropriate, for improved bucket control on steeper slopes.

The purpose of dredging steeper slopes using an excavator, as opposed to a cable-deployed bucket, is to limit the disturbance of impacted sediment on the slope during dredging, and, in turn, to limit resuspension and release. A cable-deployed bucket from a conventional derrick or crane barge can tip and slide down slope as the bucket engages the inclined face of submerged steep slope. Also, a cable-deployed bucket is like a pendulum, and the positioning of a swinging bucket can be difficult to accurately track. Alternatively, a bucket deployed on the fixed arm of an excavator can be held in place at a known location and

elevation on the slope while the bucket is closed, reducing the disturbance of the sediment on the slope.

Water Management

This BMP involves the following action:

- Prohibit direct overflow of water in sediment haul barges back to the LDW without prior processing and management as dredging return water.
- Manage and remove upland stockpile water that comes in contact with stockpiled material.

The purpose of the water management is to stop the release of sediment and associated contaminants back into the LDW from the sediment haul barge.

The material placed in a barge by an environmental mechanical dredge using an enclosed bucket consists of both sediment and water, since the bucket is not 100 percent full of sediment, and water is not allowed to drain from the bucket. During precision environmental dredging projects, the dredging bucket may be only half-full of sediment on average over the course of the project due to relatively thin cuts intended to avoid removal of non-impacted sediment and to avoid over-penetration of the bucket, with water filling the other half of the bucket. The volume of water placed in the barges for an environmental dredging project can therefore equal the volume of sediment dredged from the LDW. Thus, a 20,000-cy dredging project can result in that volume of sediment placed into barges plus another 20,000 cy of water. This is consistent with the volume of water collected with the equipment at Boeing Plant 2, where approximately 140 gallons of water were collected for every 1 cy of sediment dredged. Failure to manage the water in the barge during dredging can result in the release of turbid water into the dredged area, with the potential for increased sediment resuspension, release, and additional generated residuals.

This BMP also includes the use of upland stockpiling management procedures to contain excavated shoreline soils within stockpile areas such that transport of stockpiled soils and water that come into contact with stockpiled material to the LDW does not occur. Stockpiles will be surrounded by Ecology blocks, lined with an impervious material, and protected from weather and disturbances by an impervious covering when stockpiling is not

occurring. Upland project water that contacts contaminated stockpiled soil and runoff from the stockpile to adjacent areas will be managed, collected, treated, and/or disposed of.

The details of the water management system are presented in Section 4.11.

Intertidal Sediment and Shoreline Bank Soil Removal

This BMP involves the following action:

- Conduct intertidal sediment and shoreline bank soil excavation "in the dry" to the degree reasonably possible using land-based equipment.

Intertidal sediment and shoreline bank soil excavation "in the dry" reduces the potential for release of impacted intertidal sediment and shoreline bank soils to the LDW by removing the sediment accessible from the upland when the tides are out and the sediment is exposed. The work is best done during daylight hours during very low tides, which occur only during May through August of each year. Alternatively, low tides during the in-water construction window occur during night hours.

This BMP includes the use of shoreline-based excavation equipment working at least 2 feet back from the actual water line at all times. When and where possible, the shoreline excavation will be completed prior to dredging, as the in-water removal activities proceed generally from upstream to downstream. Excavation and dredging from upslope to down slope will reduce slope failures that can resuspend sediment and will enable the capture of any material that moves downslope during shoreline excavation work. Additional measures to minimize potential erosion in the intertidal zone will include removing large pieces of debris remaining on the surface and using the excavator bucket or similar equipment to compact the newly excavated surface during periods when shoreline excavation is not being conducted. A Temporary Erosion and Sedimentation Control fence will also be required during shoreline excavation.

Backfill Placement

This BMP involves the following actions

- Wash backfill materials prior to delivery and use at the Site

- Release in-water backfill from the bucket as close to the backfill surface as possible during placement

Washing backfill materials will remove fines and result in less turbidity in the water column during placement. Releasing backfill material close to the backfill surface will reduce the contact between placed material and the water column, resulting less suspended solids.

4.1.3 Temporary Facilities, Staging, and Access

Work performed for this project will require support facilities that will be set up and staged in phases throughout the removal action duration. These include the site work zone layout and security fence, office trailers and facilities, the parking area and transport route to the work area, water access, utilities, haul roads, soil stockpile areas, and equipment storage and maintenance areas. A detailed discussion of these temporary facilities is included in the Temporary Facilities and Controls and Environmental Protection Control Plan (Section 4.10).

4.1.4 Offsite Staging and Transloading

See Section 4.4 for a description the offsite staging and transloading procedures.

4.1.5 Key Personnel and Supervision

Table 1 is a list of key personnel that will comprise the Envirocon project team:

Table 1
Envirocon Key Personnel

Position	Name
Project Director	Jeff Johnson
Project Manager	Craig Lieneck
Construction Manager	Skip Simpson
Project Engineer – CQC Manager	Dave Gehring
Project Engineer – Survey Coordination	Dave Conklin
Cost Engineer (Off-site Support)	Josh Bale
Engineering Services Manager (Off-site Support)	Shawn Shirey

Table 2 is a list of key personnel that will comprise the Waste Management project team:

Table 2
Waste Management Key Personnel

Position	Name
Project Director	Ray Mangrum
Project Manager	Kevan McCaslin
Transportation Manager	John Borghese
Environmental Manager	Jeff Altman
Industrial Account Manager	Linda Wimmer
Lafarge Seattle Operation Manager	Jonathan Hall
Lafarge Seattle Technical Manager	Mike Depew
Lafarge Seattle Production and Shipping Supervisor	Sam Kranzthor
Lafarge Regional Safety and Health Manager	Dan Donovan

4.1.6 Project Schedule

Intertidal sediment and shoreline bank excavation and backfilling will be scheduled around the low tides, which occur during the night. Working during the low tides will allow for sediment removal from the uplands to the lowest elevation possible in the dry. Dredging and in-water backfill work will be performed 24 hours per day. A detailed project schedule is shown on Figure 6. Anticipated daily work hours for the various phases of the project are presented below.

- Mobilization and site preparation: 7:30 am – 5:30 pm
- Upland excavation and demolition: 10-hour shifts, times may vary
- Dredging and backfill activities: 24 hours per day
- Restoration and demobilization: 7:30 am – 5:30 pm

4.2 Demolition Plan

The following subsections present Envirocon's planned demolition methods. Work will be conducted in accordance with the Construction Drawings and Construction Specifications, Appendices G and H of the BODR (Anchor QEA 2013a), respectively. Shoreline demolition

activities are required to excavate impacted shoreline bank soils. Demolition activities include the following:

- Removal of the current western property fence along the shoreline top of bank
- Removal of timber pilings
- Removal of miscellaneous bank debris including concrete, brick, wood, and slag
- Partial removal, as needed, and grouting eight storm water outfalls

4.2.1 Pre-Demo Activities

Prior to beginning demolition activities, Envirocon will establish the property layout. The property layout will include a clear delineation of the work areas, including the Contractors staging area and support zone. The existing property security fencing around the shoreline work area will be supplemented with temporary security fence panels, as shown on Construction Drawing G-4 (Appendix G of the BODR; Anchor QEA 2013a). Access and staging areas will be fenced to control and delineate the active work area and to keep the public from entering the work area.

Envirocon will request locates from The Utilities Underground Location Center (One-Call utility locating service) and a private utility locating service. Locations of utilities that are in close proximity to areas that may be disturbed will be identified, recorded, and protected as needed. Existing groundwater monitoring wells, not scheduled to be decommissioned, will be protected from heavy equipment using steel plates or other means.

Site Storm Water Pollution Prevention Plan and BMPs will be installed, including the installation of a silt fence and a floating containment boom along the base of the shoreline bank.

4.2.2 Means and Methods

The existing chain link fencing along the property shoreline top of bank will be removed by Envirocon's laborers. The chain link will be rolled and stockpiled for off-site disposal. Fence posts will be removed using an excavator with a bucket and thumb, and will be stockpiled for off-site disposal as well.

Wooden pilings will be pulled from the landward side with a 90-ton crane and vibratory hammer. The removed piles will be sized on the shoreline by labor in maximum 4-foot lengths for off-site disposal. Any piles broken during removal will be cut off at the excavation surface or 3-feet below finished grade, whichever is deeper. An excavator with a bucket and thumb will be used to remove debris from the shoreline. Large concrete and debris will be sized to be less than 2-feet by 2-feet using a hydraulic hammer attachment. Sizing of piles and other debris will be done in the stockpile area designated for demolition debris sizing. Alternatively, significantly large debris may require sizing in place to facilitate transfer to the stockpile area.

Removal and plugging of outfall pipes will be completed by contractor laborers and an excavator with bucket and thumb attachment. After removing the required length, the remaining culvert will be plugged with grout. Five monitoring wells have been identified for decommissioning based on their locations within the work areas and associated planned construction activities therein. This work will be performed by a separate contractor specializing in well decommissioning prior to initiation of the removal action construction activities. The monitoring wells will be decommissioned in accordance with WAC 173-160.

4.2.3 Schedule/Hours of Work

Demolition is initially estimated to take 7 days and will be conducted from approximately September 13 to September 23, 2013. Demolition activities are anticipated to occur during a single 10-hour shift, 6 days per week. Typical work hours will be 7:30 am to 5:30 pm; however, these hours may change if needed to complete certain task or meet project schedule requirements.

4.2.4 Demolition Disposal and Salvage

The materials that may be generated during demolition activities include but are not limited to:

- Timber piers/piles
- Slag
- Concrete
- Brick

- Miscellaneous construction or metal debris
- Plastic or metal piping
- Aluminum or steel fencing
- Clearing and grubbing vegetation
- PVC or steel well casing materials
- Flush-mount well surface completion concrete and iron

Table 3 details expected material descriptions, quantities, and disposal/recycling destinations for the materials expected to be generated during demolition activities.

Table 3
Material Description and Disposal Facility

Description	Estimated Quantity	Sizing Requirement	Disposal Facility
Shoreline Bank Soil with Debris*	3,210	Debris (less than 2 feet by 2 feet)	80% CRL 20% Greater Wenatchee Regional Landfill
Dredge Material	18,000 to 19,000 cy	NA	CRL
Timber Piles	780 linear feet (LF)	4 LF maximum	CRL or Greater Wenatchee Regional Landfill
Chain link Fence	550 LF	Rolls 30-inch diameter maximum	Recycled or Greater Wenatchee Regional Landfill
Concrete/Asphalt/Slag	TBD	2 feet by 2 feet	Greater Wenatchee Regional Landfill
Miscellaneous Debris/Logs	TBD	4 LF	CRL or Greater Wenatchee Regional Landfill
Culvert Pipe	70 LF	8 LF	TBD
Clearing and Grubbing Vegetation	TBD	None	CRL

Notes:
* Material with greater than 50% debris will be disposed at Greater Wenatchee Regional Landfill and material with less than 50% debris will be disposed at CRL. Planning level estimates include 80% disposal at CRL.
CRL = Columbia Ridge Landfill
LF = linear feet
NA = not applicable
TBD = to be determined

4.3 Dredging/Excavation, Upland and Haul Barge Transport, and Dewatering Plan

The following subsections present the Envirocon's planned dredging and excavation, haul barge transport, and dewatering methods. Work will be conducted in accordance with the project Construction Drawings and Construction Specifications, Appendices G and H of the BODR (Anchor QEA 2013a), respectively..

4.3.1 Project Description

Upland and high intertidal excavation will be completed in the dry using a land-based excavator. Material will either be trucked directly off the property for disposal or temporarily stockpiled on the property for subsequent trucking and off-site disposal. In-water dredging will take place following upland and intertidal excavation or after upland excavation has proceeded north (downriver) of the dredging area. Per the Construction Specifications (Appendix H of the BODR; Anchor QEA 2013a), a precision excavator with a closed environmental bucket will be the primary dredging equipment for the removal action. In areas where the excavator and enclosed bucket is unable to remove the encountered materials (e.g., larger debris encountered), a conventional derrick with clamshell will be used to remove those materials.

Dredged materials will be placed into sealed (water tight) sediment barges, excess water will be removed and treated using site-specific water treatment procedures (see Section 4.11), and then the dewatered sediment barge will be transported via tug to the EPA-approved transload facility. If required based on additional Geoprobe characterization results (see Section 1.4), the final dredging activities may include the removal of sediment with PCB concentrations greater than 50 mg/kg dry weight and therefore managed under the TSCA. This sediment would be disposed of separately from the other removed non-TSCA sediment. The dredged TSCA sediment would be direct loaded into lined containers staged on a sediment barge(s), excess water would be removed and treated using the site-specific water treatment system (see Section 4.11), and the containers would be off-loaded using an upland crane staged at the Jorgensen Forge property or Lafarge Facility.

4.3.2 Work Sequence

The overall work task sequence is expected to be:

1. Mobilize upland equipment for excavation activities.
2. Install BMPs and construct stockpile loading areas.
3. Perform debris removal on the shoreline bank.
4. Excavate shoreline bank soil that is able to be removed from the upland (approximately +2.0 MLLW elevation and higher) from the south end of Jorgensen Forge Facility at sheet pile wall to the north end of RAB.
5. Using the back of the excavator bucket, compact the final excavation elevation soil to minimize slope erosion until shoreline containment materials are placed.
6. Perform final survey of all bank and shoreline areas excavated from the upland.
7. Mobilize dredging equipment, dewatering equipment, water treatment barge, and backfill equipment.
8. Begin dredging remaining sediment to be removed (approximately +2.0 MLLW elevation and lower) from the south end of Jorgensen Forge property to the downriver RAB. As described in Section 4.1.2, 3 to 6 inches of interim sand cover will be placed over each DMU as soon as practical following survey approvals.
9. If necessary based on Geoprobe soil boring characterization results (see Section 1.4), mobilize barge(s) with lined TSCA containers in place.
10. Dredge TSCA sediment directly into lined containers, perform necessary dewatering and treatment, and transfer containers to upland facility.
11. Receive final approval of dredged management units.
12. Demobilize dredging equipment, dewatering equipment, and water treatment equipment and barge.

4.3.3 Means and Methods

Debris removal and demolition activities will be performed following site preparation. Additional details on demolition activities are included in the demolition plan (Section 4.2). Production rates may vary depending on difficulty removing piles, concrete, and slag. Bank debris will be loaded directly into an articulated haul truck for transport to the stockpile and sizing location on the property, where it will be appropriately sized for transport using an excavator with a hydraulic hammer attachment and laborers. Once the majority of large

debris has been removed, shoreline bank excavation will proceed from south to north. The production rate for this excavation is estimated to average approximately 500 cy per day. This material will either be loaded directly into trucks and containers for transport to the permitted off-property disposal facility, or it will be loaded into an articulated haul truck for transport to the soil/sediment stockpile area on the property. Stockpiled materials will be loaded into trucks and containers with an excavator for transport to the permitted off-property disposal facility. A grade checker will verify the final excavation surface has been achieved prior to requesting the final survey. The final shoreline bank survey will be performed following completion of all excavation that can be completed in the dry using upland equipment.

Following the completion of shoreline bank excavation activities from the uplands, dredging equipment will be mobilized to the RAB. Dredging will occur from the southern RAB adjacent to the concrete panel wall, and will proceed downriver to the northern RAB. Dredging will commence from higher to lower elevations as the equipment moves downriver. Eight DMUs have been developed within the dredge limits (Figure 7). The DMUs are configured in a single row from south to north (I through VIII). Additionally, two dredge lanes have been established (Lane 1 – Shallow and Lane 2 – Deep). Within a DMU, dredging will be completed south to north in the Lane 1, then from south to north in Lane 2. All dredging within a DMU will be completed prior to moving north to the adjacent DMU. Daily progress surveys will be performed to ensure the final target design elevations have been achieved before proceeding too far downriver of a DMU. Daily production rates are anticipated to vary, but are expected to be between 500 and 1200 cy per day, with an average production rate of approximately 700 to 750 cy per day. Sediment will be direct loaded into one of five sealed sediment material barges, and will be continually dewatered during loading. Water will be pumped to an adjacent pre-treatment barge followed by pumping to a second water treatment barge. Once the treated water achieves the measured conventional parameter goals, the water will be discharged back into the LDW in the direct vicinity of the dredging activities. Additional details on the management of the dredge water are included in the Water Management and Treatment Plan (Section 4.11).

Once the dredged sediment is loaded into a material barge and dewatered it will be transported with tugs to the Lafarge transloading facility for off-loading. After the sediment

barge is emptied, the tugs will transport and stage empty sediment barges in the staging area next to the dredge zone. Additional details on haul barge transport are included in the Vessel Management Plan (Section 4.7).

4.3.4 Positioning Methods and Procedures

Positioning methods and procedures will be consistent with the first season of the Boeing DSOA cleanup. The dredge barge will be positioned at the start of dredging activities and the fixed spuds will be lowered. The dredge excavator is equipped with DredgePak and an RTK GPS positioning indicator on the bucket. Prior to initiating dredging, all target design elevations will be loaded into DredgePak, and the dredge operator will use these elevations to guide the dredging activities. The RTK GPS sensor will allow for accurate dredging and maximum efficiency during sediment removal. This information is continually transferred to the DredgePak monitoring screen to allow the operator to precisely dredge sediments to the required depths. Once dredging has been performed within the reach of the excavator, the dredge barge will be moved using the walking spud and tugs to reposition in the next planned dredge zone. This movement will continue between the walking spud and the tugs to achieve removal of all required design elevations. Additional details on dredge positioning are included in the Survey Plan (Section 4.6).

4.3.5 Quantity Tracking

The upland and shoreline bank excavation quantities will be documented through the completion of a final intertidal survey by Envirocon's independent surveyor, following completion of excavation activities. Additionally, a portion of the upland excavation areas may be surveyed by eTrac from the survey boat during high tides. This final survey will be approved by Anchor QEA to ensure sufficient excavation has occurred and shoreline containment placement can proceed.

Daily progress surveys will be performed to track the progress of dredging activities and ensure the design elevations within a DMU are achieved before proceeding to the next downriver DMU. As soon as practical following Anchor QEA survey approval for each DMU, a clean interim sand cover ranging from 3- to 6-inches thick will be placed throughout the DMU. Final backfill placement will conducted when dredging is complete,

as described in the Backfilling Plan (Section 4.5). For cost tracking purposes, an additional survey will be performed if TSCA removal is performed, so this volume can be tracked separately from the non-TSCA removal volume. Additional details on survey methods are included in the Survey Plan (Section 4.6).

4.3.6 Transloading Material

See Section 4.4 for a description of the procedures for transloading material.

4.3.7 Schedule and Hours of Work

Dredging and excavation is initially estimated to take 30 days and will be conducted from approximately September 13 to October 31, 2013. During upland activities when dredging is not occurring, one 10-hour shift 6 days per week is anticipated. Due to low tides occurring at night, if truck and container load out activities on the property cannot be accomplished during the nighttime excavation hours, a limited crew day shift would be necessary for material load out. When dredging is occurring, work will be performed 24 hours a day, 6 days per week.

4.3.8 Water Quality Management

See Section 4.11 for water management and treatment procedures to be performed on the property and within the LDW.

4.3.9 Notifications

The following notifications will be made by Envirocon and/or the Owner representatives:

1. Send a letter, with a copy to the Engineer, to the Commander, Thirteenth Coast Guard District, 915 Second Avenue, Seattle, Washington, 98174-1067, at least 14 days prior to the commencement of dredging, notifying the Coast Guard as to the start of dredging operations.
2. Immediately report any spills to the state waters, spills on to land with the potential for entry to state waters, any other significant water quality impacts, distressed or dying fish, and buried chemicals, to Anchor QEA, at (206) 287-9130.

3. Report any water quality violations to EPA, per the 401 Water Quality Memorandum and Washington State Department of Fish and Wildlife Services (WDFW) per the WDFW Biological Opinion.
4. Report any dead, dying or distressed fish to the WDFW.
5. Provide ongoing construction schedule notifications to the Muckleshoot Tribe to minimize impacts to Tribal fishing rights and practices.

4.4 Transportation and Disposal Plan

The following subsections describe the transportation and disposal plan for the removal of impacted sediments and associated shoreline bank soils. The removal action is expected to remove an estimated 18,000 to 19,000 cy of dredge sediment and 3,210 cy of upland and shoreline bank soils. Waste Management National Services (WM) has been selected by to provide Transload Transport and Disposal (TTD) services. WM has contracted with an upland waterfront TTD site to unload sediment barges for reload to either gondola rail cars or truck and pups for transport to Columbia Ridge Landfill (CRL). The primary method of transload from the TTD site will be via 30-ton capacity truck and trailer combinations delivered to the WM facility located at 70 S. Alaska St., Seattle, Washington, for reload and train transfer to CRL. Sediments will be unloaded from the gondola cars and used for daily cover at the landfill. WM has also contracted with an upland trucking services company to transport upland and shoreline bank soils and associated debris to either CRL or Greater Wenatchee Regional Landfill.

Loaded sediment barges will be transported downstream on the LDW from the construction area to the Lafarge Cement Plant (Plant) located at 5400 West Marginal Way SW, Seattle, Washington 98106 (Figure 1). The Plant sits on the west shore of the LDW at river mile 1.1, with Kellogg Island immediately to the north (Figure 8). The Plant is a 22-acre cement manufacturing operation, with a 1,100-foot wharf on the waterway. The Plant closed the kiln in October 2010, but continues to mix dry cement mixtures from supplies shipped from other Lafarge facilities. The facility has a rail mounted tower crane equipped with a 10 cy clamshell bucket, a concrete vault to store wet materials, a 1,100-foot-long wharf with 24 feet of water at MLLW, 2,900 feet of rail space serviced by the Burlington and Northern Railroad, and certified truck and rail scales, and it has the capacity to transload dredge

material from barge to truck or railcar at a rate that exceeds 2,700 tons per day, 24 hours per day, seven days per week (Figure 9).

The Slip 4 EAA and first season of the Boeing DSOA cleanup projects were recently completed, without incident, at this Plant using the same equipment and approach as described for the Jorgensen Forge EAA removal action.

Unloading of vessels not associated with the dredging and transloading operations at the TTD facility may be necessary during the construction season. In the event that unloading of other vessels at the TTD facility is needed, all members of the project team will be notified prior to these activities taking place. Every effort will be made to schedule these events during slack times to ensure continued smooth operations with no impacts to the barge offloading and transloading operations.

The shoreline bank excavation will be completed during the low tides, which occur at night during the scheduled timeframe. Loading of the shoreline bank material will also occur at night, to maintain a single 10-hour work shift. The excavated shoreline bank material will be loaded into trucks for off-property transport and disposal. Material transport trucks entering the property will be lined with plastic from a scaffold and platform setup along the access route to the material load-out area. Once the trucks have been lined, Envirocon will load the trucks in the stockpile area or directly from the excavation area, depending on access. Trucks will be loaded using an excavator. During loading operations, plastic will be placed on the ground, where there is potential for spillage from the excavator. Envirocon personnel will clean up any spilled materials when loading is complete. Trucks will be equipped with automatic tarps and will be inspected prior to leaving the loading area to ensure that there is no spilled material on the exterior of the truck. Any material found on the truck will be removed prior to departure from the loading area.

Debris will be sized no larger than 2 feet by 2 feet prior to loading. This sizing will be performed in an unlined concrete pad area to avoid damage to the plastic lined area for containment of soil materials. Effort will be made to load material into trucks such that there is less than 50 percent debris, so the load can be transported to the WM facility located at 70 S. Alaska St., Seattle, Washington, for reload and train transfer to CRL. If the amount

or distribution of debris makes it impractical or inefficient for loading less than 50 percent debris, loads with greater than 50 percent debris will be transported to Greater Wenatchee Regional Landfill.

4.4.1 Generated Wastes

See Section 4.2.4 for the expected waste material descriptions, quantities, sizing requirements, and disposal and recycling destinations.

4.4.2 Proposed Disposal Facilities

The following disposal facilities will be used:

- Columbia Ridge Landfill (CRL)
- Greater Wenatchee Regional Landfill

4.5 Backfilling Plan

The following subsections present the backfilling plan and include the material sources, products, and suppliers, as well as, the means and methods for transporting, placing, and measuring backfill materials. Work will be conducted in accordance with the project Construction Drawings and Construction Specifications, Appendices G and H of the BODR (Anchor QEA 2013a), respectively..

4.5.1 Material Sources, Products, and Suppliers

The required backfill materials include the following:

- Upland backfill (gravel borrow)
- Backfill (clean, free draining sand)
- Select filter material (clean, free-draining sandy gravel or gravelly sand) uniformly amended with 0.5% granular GAC
- Light loose riprap
- Habitat substrate (clean rounded or sub-rounded gravel).

The specifications for these materials are included in the Construction Specifications (Appendix H of the BODR; Anchor QEA 2013a). Material will be provided by CalPortland

with the exception of the light loose riprap, which may be provided by City Transfer, Inc. Potential quarry sources include the Pioneer Pit in DuPont, Washington and the Johns Prairie Pit in Shelton, WA. If CalPortland provides light loose riprap it will be from the White River Pit in Enumclaw, Washington. Final quarry sources and materials will be approved by the Engineer prior to use. In accordance with the Construction Specifications Envirocon will provide:

- Import materials source report with gradation and chemical analysis of borrow source samples
- Documentation of the origin of backfilling source materials
- Inspection of the borrow source(s)
- 50-pound representative composite samples of materials from each borrow source
- Product specifications for GAC and the means of GAC content verification

The material submittals listed above will be subject to Engineer approval.

4.5.2 Means and Methods

Prior to in-water backfill placement, final sub-tidal surveys of each DMU will be performed as described in Section 4.3. As each DMU is dredged, surveyed, and approved as complete, 3 to 6 inches of sand cover will be placed over the approved DMU as soon as practical given equipment availability, access, and post-dredge Z-layer sampling activities. The backfilling activities will proceed from south to north. Following placement of this initial sand cover throughout the DMU, additional backfill material will be placed in the DMU to raise the elevations within approximately two feet of the final design grades. The final approximately two feet of backfill materials will be placed in each DMU following the Owner's approval that all dredging is complete. Once dredging is complete and final backfill placement begins, a multi-beam survey will be performed daily within backfilled areas by eTrac until final design grades are achieved and approved by the Owner. A more detailed discussion on hydrographic surveys is included in the Survey Plan presented in Section 4.6.

In-water backfilling will be performed prior to placement of the shoreline containment backfill to prevent potential sloughing and disturbance of remaining sediments. The in-water area below the toe of shoreline bank trench, which resides at approximately -5 ft MLLW

elevation, will be backfilled with sand to the final design surface. The area above the toe of the shoreline bank trench will consist of a minimum 1.5-foot filter layer (gravelly-sand or sandy-gravel amended with 0.5 percent GAC), overlain by a minimum 2.5-foot riprap armoring layer, and overlain by a minimum 0.5-foot habitat substrate layer. Approximately 40 percent of the shoreline containment backfill will be placed in-water due to toe trench elevation. The remaining 60 percent will be placed in the dry (above the water surface elevation), from the upland area using a long reach excavator. To achieve the final backfill surfaces, continuous grade checking will be conducted with surveying to verify that backfill is placed within the contract approved tolerances and to the proper slope angles.

Prior to upland backfill placement, a final intertidal survey will be performed within all areas excavated from the upland as described in Section 4.3. Once backfill placement begins, grade checks will be performed daily by Envirocon's surveyors until final grades for each layer are achieved. When final grades are achieved, a final survey of that layer will be submitted to the Owner for approval. A more detailed discussion on upland surveys is included in the Survey Plan presented in Section 4.6.

In-water backfill will be placed with the Skookum, which is the same piece of equipment utilized for backfill placement during the first season of the Boeing DSOA cleanup. The Skookum is equipped with single beam sonar and the operator will be equipped with Win Ops (Clam Vision) and Tide Wire to assist in placement of backfill materials. The use of these tools allows for placement of an accurate thickness of material and provides the operator with guidance on when to release materials above the bottom profile. This control minimizes turbidity during placement. Two backfill barges with 1,000 to 1,500 cy of backfill capacity will be used. The Skookum will obtain backfill from these barges and will place the in-water backfill. One tug will be used to ensure the backfill barge not being used is being transported to the selected backfill material source (CalPortland) for loading, and being loaded with backfill material or being staged for use when the in-use barge is empty. Certified tonnage displacement curves will be provided separately for the two backfill barges.

Shoreline bank and upland backfill will be achieved by a combination of grade staking, visual placement methods, and the use of a grade checker equipped with an RTK-GPS unit. No shoreline bank backfill will be placed until in-water backfill has been placed, in order to

prevent sloughing of materials down the slope. Shoreline bank material will be placed using an excavator and bucket. The excavator will load the material into the bucket, place the bucket at the lowest elevation for material placement, and spread or pull the materials upward toward the excavator to achieve the design layer thickness. As the excavator proceeds downriver, the grade checker will perform checks on the completed surface and mark where additional cut and fill is required to achieve the slope containment backfill grades. The excavator will balance the cuts and fills, using additional material as necessary until the grade checker approves the final surface elevations. While the excavator is working to achieve final surfaces in a particular portion of the bank, support equipment may stockpile material on the shoreline bank ahead of the excavator for future shoreline containment placement; however, all stockpiled materials will be placed before the tides inundate the backfill area. Riprap will be keyed into the underlying filter layer with pressure from the back of the excavator bucket to improve stability. It is estimated that at least 500 cy of backfill can be placed in one shift.

The filter material layer placed from the toe trench to the top of the back will contain 0.5 percent GAC blended into the filter sand and gravel at the quarry. Since the GAC is lighter than the sand and gravel and has a high porosity, it has a tendency to float to the top of the filter material when is placed in water. To minimize this, the filter materials will be wetted prior to placement, allowing the GAC to settle at the same rate as the filter sand. Wetting will also occur during upland placement to minimize the potential for the surficial GAC to float as the tide rises and inundates the shoreline.

4.5.3 Schedule and Hours of Work

Backfilling is initially estimated to take 27 days and will be conducted from approximately October 3 through November 1, 2013. Work will be performed 24 hours a day, 6 days a week.

4.6 Survey Plan

A project Survey Plan prepared by Envirocon is included in Appendix A

4.7 Vessel Management Plan

A project vessel management plan prepared by Envirocon is included in Appendix B.

4.8 Traffic Control Plan

A project traffic control plan prepared by the Envirocon is included in Appendix C.

4.9 Contractor Quality Control Plan

A Contractor quality control plan is included in Appendix D.

4.10 Temporary Facilities Controls and Environmental Pollution Control Plan

A temporary facilities controls and environmental pollution control plan prepared by the Contractor is included in Appendix E.

4.11 Water Management and Treatment Plan

In accordance with the BMPs identified in Section 4.1.2, water associated with both dredging and shoreline bank excavation and stockpiling will be contained and managed. There will be no direct overflow of water from the sediment haul barges back to the LDW without prior processing and management as dredging return water. Water that comes in contact with or drains from stockpiled material will also be contained and managed. The purpose of the water management is to prevent the release of sediment and associated contaminants back into the LDW from the sediment haul barge or shoreline bank excavation activities.

4.11.1 Upland Excavation and Stockpile Water Management

Water that accumulates in the upland soil stockpile area will be collected. The collected water will be contained in 21,000-gallon holding tanks. Water from these tanks will be sampled and tested for compliance with the King County Industrial Waste Program Permit. If the water is in compliance with the discharge permit requirements, it will be discharged into the King County Sewer System. Water not meeting discharge requirements will be conveyed through a100-gallon-per-minute sand media filtration system and into a 21,000-gallon post-treatment holding tank. Prior to discharge into the King County Sewer System,

the water in the post-treatment holding tank will achieve the King County Industrial Waste Program Permit requirements.

4.11.2 Dredge Water Management

The dredge water management system will process water generated from the in-water dredging operation. The system has been designed by Envirocon and their subcontractor, StormTec. The daily volume of water to be processed will be proportional to the volume of sediments dredged. Based on estimated sediment production rates, it is anticipated that the dredge water production will range from around 250,000 gallons per day (gpd) to a maximum of 480,000 gpd. The dredge water processing system has been designed to handle the maximum anticipated flow, but is expected to typically operate in the 200,000 to 300,000 gpd range.

Dredge water will be treated on the LDW either within or directly adjacent to the RAB. Envirocon will provide a dredge water treatment system that consists of an initial pre-treatment barge (the five variable sized sealed sediment barges will be used for this function) and a subsequent water treatment barge that is 230 feet by 60 feet (Figure 10). The barges will be operated by a crew of three laborers and a water treatment technician and be moored against installed temporary mooring piles just downstream of the RAB in the Boeing DSOA area (Figure 9). Dredging operations will include two 10-hour shifts so the water treatment will operate 24 hours per day to support dredging operations. The water treatment barge will be moored to temporary piling located adjacent to dredging area.

Dredged sediment and associated water contained in the dredge bucket will be directly loaded into sealed sediment barges for dewatering and subsequent off-site transport and transloading for disposal. Free, ponded water will be pumped from the sealed sediment barges to an adjacent pre-treatment barge through a 6-inch diameter HDPE line using a 6-inch Godwin Pump. The objective of the pre-treatment barge is to dissipate the energy of the high discharge rate pumped water and facilitate initial settling of heavier fraction solids, such as sand, gravel, and debris, from the sediment laden dredge water. The water will initially flow into an energy dissipation structure constructed of sand bags and/or a large diameter pipe. Water will then flow from the structure across the deck through a series of

straw wattles secured with sand bags. The barge will be weighted on one end with ecology blocks to facilitate water movement across the wattles under gravity (Figure 10).

Water from the pre-treatment barge will be pumped to an adjacent treatment barge through a 4-inch diameter PVC pipe using a 4-inch Godwin Pump. A backup/redundant 4-inch pump and header system will be installed to ensure pre-treated water can be continually pumped from the pretreatment barge to avoid impacting dredging operations. Redundant settling tanks will also be installed to allow continuous operation during maintenance or equipment failure. The treatment barge will be equipped with the following:

- Four – 20,000 gallon first stage settling tanks
- Two – 20,000 gallon second stage settling tanks
- Two – 20,000 gallon third stage settling tanks
- Two – 20,000 gallon weir tanks
- One – Flocculent Injection System equipped with dual flocculent injection pumps
- One – Water quality box
- One – STF800 sand media filter
- One – skid mounted pump package
- Three – 4-inch CD100M Dri-Prime Pumps

As pre-treated water enters the treatment barge it will be pumped through a flocculent injection system and into the first stage settling tanks. Water will gravity flow through 6-inch flex lines from first stage settling tanks, to the second stage settling tanks, to the weir tanks, and finally into the water quality box (Figure 10). The water quality box will have real-time turbidity measurement capability. Water entering the water quality box is greater than 200 Nephelometric Turbidity Units (NTUs) will by-pass the STF800 sand media filter and be pumped to the third stage settling tanks, where it will gravity flow back through the treatment system. If water entering the water quality box is less than or equal to 200 NTUs, it will be pumped through the sand filter. Water discharging from the sand filter will be pumped back through the water quality box. Water with less than or equal to 10 NTUs will be discharged through a 6-inch line back to the dredging location. Water with greater than approximately 10 NTU (after sand filtration and recirculation to the water quality box) will be micro-dosed in the water quality box with additional flocculent and pumped to the third stage settling tanks, where it will gravity flow back into the treatment system. Valves

controlling the flow of water from the water quality box, as described above, will be automatically controlled by the real-time turbidity meter. The operation of the water quality box will be regularly monitored by the water treatment technician.

It is anticipated that once per shift (10 hours) or day a sediment barge will be outfitted with the energy dissipation structure and wattles to be used as the replacement for the pre-treatment barge. The used pre-treatment barge with wattles and entrained coarse grained solids will be used as the next shifts a sediment barge when sufficient coarse grained materials build up behind the wattles. Dredged materials and associated water will then be placed directly on top of the wattles and they will be disposed with the dredged materials.

4.12 Site-specific Health and Safety Plan

The Site-specific Health and Safety Plan is included in Appendix F.

5 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL

The construction quality assurance (CQA) program to be implemented during the removal action is described in Section 5 of the CQAP (Appendix D of the BODR, Anchor QEA 2013a). This section provides an overview of the CQA activities and how these activities will be coordinated with the General Contractors and the Envirocon's Quality Control Plan (Section 4.9)

5.1 Submittal Management

All final construction documentation will be stamped, as appropriate, by licensed professionals. If, during the course of construction, modification of the final stamped and approved design is required, modifications will be documented in writing and stamped by a licensed engineer. Undocumented modifications of the design or other deviations from the approved design will not be permitted. Construction surveys, including as-built surveys, will be documented on drawings using the same datum, unit, and scale as design drawings. Record drawings will allow for a direct visual assessment of the quality and completeness of construction. Section 013300 of the Construction Specifications (Appendix H of the BODR; Anchor QEA 2013) identifies the required General Contractor submittal procedures.

The records described in this section will be maintained in the project files. Monitoring data will be provided electronically to EPA in the Removal Action Completion Report (RACR).

5.2 Weekly Progress Meetings

Weekly progress meetings will be coordinated with EPA and its partner agencies including pre-notification of time and place of meetings. Conference call access will be provided as needed and requested by those agencies and meeting minutes will be prepared and made available to attendees. As part of ongoing coordination efforts with Boeing, the Owner will determine if and when Boeing representatives should be invited to attend the weekly meetings. Section 013100 of the Construction Specifications identifies the required attendees and standard agenda for weekly meetings.

5.3 Inspection, Sampling, and Verification Activities

5.3.1 Overview

The Contractor will implement the Contractor Quality Control Plan as described in Section 4.9. Additional quality assurance activities will be conducted by the Owner and Construction Management team as described in the following sections and in the CQAP (Appendix D of the BODR; Anchor QEA 2013a).

5.3.2 Verification Survey

The Contractor will conduct survey activities as detailed in the Survey Plan presented in Section 4.6 and in accordance with the Contract Documents. In addition to the survey activities conducted by the contractor, post-dredging bathymetric surveys will be performed by the Owner using a multi-beam fathometer. In areas that a survey vessel is unable to access, pole soundings or land-based conventional upland survey methods will be employed to supplement the data collection. Survey lines will be set at a 25-foot-grid spacing perpendicular and parallel to the dredge cut where practical. Pole sounding measurements will be taken at a maximum interval of 10 feet along each transect or at a noted break in grade. A Real Time Kinematic Global Positioning System (RTK GPS) will be used to determine the horizontal position of each shallow water survey measurement taken. The Owner will also process the survey data obtained to verify the target elevations have been achieved.

5.4 Documentation and Reporting

During construction activities, various documents will be generated as required by the Construction Specifications, CQAP (Appendix D of the BODR; Anchor QEA 2013a), and Contractor Quality Control Plan (Section 4.9). These documents and reporting requirements are presented in the following sections.

5.4.1 Contractor's Daily Quality Control Report

The Contractor will be required to provide a variety of documentation to the CQAO, including testing results of materials received, weigh tickets for shipments of materials removed, survey results, and documentation of pay items completed. The Contractor will

also submit a Daily Quality Control Report to the CQAO, as specified in the CQAP (Appendix D of the BODR; Anchor QEA 2013a). These Daily Quality Control Reports will be sent to EPA on a weekly basis as part of the Weekly Summary Report prepared by the CQAO in cooperation with the General Contractors.

5.4.2 Construction Quality Assurance Officer's Daily Report

The CQAO will maintain a daily field log to record observations, measurements, inspections completed, data received, communications with other members of the project team or EPA, any water quality exceedances, additional environmental controls that were implemented, problems encountered, and resolutions. The daily field log will be supported by submittals received from the Contractor, such as survey results and weigh tickets, chain of custody forms for water quality monitoring samples collected, laboratory data received, inspection reports, and written communication from members of the project team or EPA. Water quality results will also be separately recorded and reported as defined in the Water Quality Monitoring Plan WQMP (Appendix E of the BODR; Anchor 2013a). The CQAO will submit weekly progress reports to EPA as described in Section 6.2.3 of the CQAP (Appendix D of the BODR; Anchor QEA 2013a).

5.4.3 Water Quality Monitoring Reports

Daily, weekly, and final reporting of water quality monitoring results will be required for this project. Data will be collected and recorded in the field on the Water Quality Monitoring Form as described in the WQMP (Appendix E of the BODR; Anchor 2013a). At the end of each field day, the field forms will be scanned and e-mailed to the CQAO. Unless an exceedance of a water quality parameter occurs (which would trigger the contingency response actions described in Section 6 of the WQMP), daily field results will not be transmitted to EPA unless specifically requested.

The results from each week's water quality monitoring activities will be compiled into a summary table with a comparison to water quality compliance criteria. The weekly summaries will be provided to EPA within 2 business days of the work (i.e., generally by the close of business on Tuesday of the following week). The weekly summary tables and compliance evaluations will be performed by designated office support staff under the

direction of the Water Quality Field Leader. All reporting will include both regularly scheduled monitoring and any additional monitoring results that may have been triggered by exceedances of water quality criteria.

After all construction has been completed, the water quality monitoring data for the entire construction project will be provided to the EPA in a Water Quality Monitoring Report (WQMR) as an appendix to the Removal Action Completion Report. The content of the WQMR is specified in the WQMP (Appendix E of the BODR; Anchor 2013a).

5.4.4 Hydrographic and Topographic Survey Reports

The Contractor will conduct survey activities and submit daily survey progress reports as detailed in the Survey Plan presented in Section 4.6.

5.4.5 Sediment Verification Sampling

Post-dredge sediment samples and post shoreline excavation bank samples will be collected to confirm chemical concentrations following the removal action activities. Additionally, pre- and post-construction perimeter surface sediment samples will be collected to evaluate whether there are significant increases in concentrations of COCs in surface sediments adjacent to the RAB relative to pre-remediation concentrations as a result of construction activities. The sediment verification sampling requirements are included in the CQAP (Appendix D of the BODR; Anchor QEA 2013a) and in the Field Sampling Plan (FSP) (Appendix C of the BODR; Anchor QEA 2013a). Detailed field and laboratory quality assurance and quality control criteria, including method specifications, detection limits, accuracy, and precision requirements are included in the Quality Assurance Project Plan (QAPP) (Appendix D of the BODR; Anchor QEA 2013a)

5.4.6 Borrow Site Characterization Reports

Prior to any on-site placement of import materials, the Contractor shall submit a Borrow Site Characterization Report to the CQAO. The characterization report will include identification of the source (including a map documenting the origin of the material), site inspection, and material sample and characterization (physical and chemical testing, as

specified) to ensure that the import material will uniformly meet the chemical and physical specifications of its intended use.

5.5 Field Change Documentation

The Owners and their consultants will meet weekly with the General Contractors and EPA to review the CQAO Weekly Summary Report and to keep the EPA informed of continuing events as the cleanup work proceeds. Any work not in accordance with the EPA-approved BODR (Anchor QEA 2013) and this RAWP will be communicated to EPA. In some cases the corrective actions will involve the Contractor correcting the Work to comply with the Construction Drawings and Construction Specifications (Appendix G and H of the BODR; Anchor QEA 2013). In other cases, changes to the design may be necessary and therefore require a change order with the General Contractor.

In the event that a change or changed condition is encountered by the General Contactor as defined in the Construction Specifications (Appendix H of the BODR; Anchor QEA 2013), or if CQA inspections reveal out-of-specification conditions requiring a change in the design or construction process, the Owner's consultant will review the condition to assess what revision to the design may be required to maintain consistency with the intent of the Construction Specifications. When immediate direction is required, written direction may be issued by the Project Engineer to the General Contractor after consulting with the Owner to recommend the needed revision(s) to the design and obtaining EPA approval.

Any changes to EPA-approved documents shall be reviewed and approved by EPA prior to implementation. The EPA review will determine whether the change is consistent with cleanup objectives and is protective of human health and the environment. In addition, EPA review will ensure that the change conforms to performance standards, applicable or relevant and appropriate requirements, and requirements of the SOW. Any changes will be included in the CQAO Weekly Summary Reports.

5.6 Post-Construction Documentation

Within 90 days of EPA confirmation that the removal action requirements have been fulfilled (excluding long-term post-construction monitoring requirements), the Owner will submit a Draft RACR. The Draft RACR will contain the following information:

- Introduction
  - Site location
  - Environmental setting
  - Relevant operational history
  - Summary of previous investigations and actions
- Removal Action Background
  - Basis for the removal action (i.e., the AOC)
  - Context within overall LDW Superfund Site
  - RAOs
  - Summary of design basis
  - Summary of deviations from the design, if any
- Construction Activities
  - Description of dredging activities
  - Description of shoreline bank reconfiguration
  - Description of backfill and armor placement
  - Description of transport, offloading and off-site disposal
  - Description of construction monitoring activities
  - Description of completion and demobilization
- Chronology of Events
  - Description of the timing of construction activities, identifying milestones with reference to a tabular summary of a more detailed construction timeline
- Performance Standards and CQC
  - Description of performance objectives and verification activities performed to confirm the removal action was implemented in accordance with the Construction Specifications and Drawings

  - Description of actual construction performance relative to performance objectives, including a summary of the results of CQA measurements and analyses
  - Description of contingency actions implemented, if any were necessary
  - Description of EPA's oversight activities
  - Summary of z-layer sampling and perimeter monitoring results
  - (Note: quality assurance for water quality monitoring analytical data will be included in the Final WQMR)

- Final Inspection and Certifications
  - Description of final inspections, including the scope of inspections and noting any deficiencies identified and corrective actions implemented
  - Summary of health and safety monitoring during the implementation of the removal action with notation of deviations or incidents, if applicable
  - Identification of any institutional or engineering controls that are implemented to maintain the integrity of the removal action, including identification of parties responsible for maintaining and enforcing controls
  - If applicable, summary of close out requirements for off-site offloading facility
- Operation and Maintenance Activities
  - Description of post-construction monitoring and maintenance requirements
  - Description of contingency measures that would be implemented if post-construction monitoring indicates such measures are warranted
- Summary of Project Costs
  - Identification of the actual final costs incurred to comply with the provisions of the AOC
  - Identification of costs previously estimated for implementation of the removal action and an update of the cost estimate for post-construction monitoring and maintenance costs
- Observations and Lessons Learned
  - Identification of problems encountered, if any, in implementing the removal action and corrective actions
  - Identification of successes in implementing the removal action

  - Analysis of lessons learned that may be applied to future activities

- Removal Action Contact Information
  - Identification of individuals (contact names, addresses, and phone numbers) for design and remediation contractors, EPA oversight contractors, and key personnel at the Owner, EPA, and other agencies

The RACR will also include copies of as-built drawings, summaries of waste disposal and analytical results, the Final WQMR, and the certification statement required by the AOC.

If applicable, the Owner will submit a Final RACR within 60 day of receipt of EPA comments on the Draft RACR.

6 PROJECT SCHEDULE

See Section 4 for a description of Envirocon's project schedule and Figure 6. This is subject to change based on production rates during completion of the work and encountered field conditions.

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EPA, 2013. Electronic email RE: Updated Boeing Plant 2 Dredge Schedule: Season 2. Prepared by Holly Arrigoni of EPA to Amy Essig Desai of Farallon Consulting. August 8.

FIGURES

APPENDIX A
SURVEY PLAN

APPENDIX B
VESSEL MANAGEMENT PLAN

APPENDIX C
TRAFFIC CONTROL PLAN

APPENDIX D
CONTRACTOR QUALITY CONTROL PLAN

APPENDIX E
TEMPORARY FACILITIES AND ENVIRONMENTAL POLLUTION CONTROL PLAN

APPENDIX F
SITE-SPECIFIC HEALTH AND SAFETY PLAN